

## CLAIMS

1. A method for producing a silicon epitaxial wafer, comprising:

a hydrogen heat treatment step of arranging a susceptor capable of mounting a silicon single crystal substrate within a reactor and subjecting the silicon single crystal substrate mounted on the susceptor to heat treatment in a hydrogen atmosphere; and

a vapor phase epitaxy step of epitaxially growing a silicon epitaxial layer after the hydrogen heat treatment step,

wherein the silicon single crystal substrate is separated from the susceptor during the hydrogen heat treatment step, and the silicon single crystal substrate is mounted on the susceptor during the vapor phase epitaxy step.

2. The method for producing the silicon epitaxial wafer as claimed in claim 1, wherein the silicon single crystal substrate is separated from the susceptor by allowing a lift pin which vertically moves the silicon single crystal substrate relatively to the susceptor to support the silicon single crystal substrate.

3. The method for producing the silicon

epitaxial wafer as claimed in claim 1 or 2, wherein the hydrogen heat treatment step is performed at a temperature lower than a vapor phase epitaxy temperature of the silicon epitaxial layer.

4. The method for producing the silicon epitaxial wafer as claimed in any one of claims 1 to 3, wherein in the hydrogen heat treatment step, a temperature within the reactor when the silicon single crystal substrate is separated from the susceptor is at least 900°C.

5. The method for producing the silicon epitaxial wafer as claimed in any one of claims 1 to 4, further comprising a cleaning step of cleaning the silicon single crystal substrate before the hydrogen heat treatment step,

wherein the cleaning step has natural oxide film removal cleaning for removing a natural oxide film formed at least on a rear main surface of the silicon single crystal substrate, and the natural oxide film removal cleaning is performed as final cleaning of the rear main surface.

6. The method for producing the silicon epitaxial wafer as claimed in claim 5, wherein in the

natural oxide film removal cleaning, the natural oxide film is cleaned and removed using hydrofluoric acid.

7. The method for producing the silicon epitaxial wafer as claimed in claim 5 or 6, wherein the cleaning step has front main surface oxide film formation cleaning for forming an oxide film on a front main surface of the silicon single crystal substrate, and the front main surface oxide film formation cleaning is performed as final cleaning of the front main surface.

8. The method for producing the silicon epitaxial wafer as claimed in claim 7, wherein a time for the silicon single crystal substrate to be stored in air during the period that the substrate is fed into the reactor after the final cleaning is set within 3 days.

9. A method for producing a silicon epitaxial wafer, comprising:

a cleaning step of cleaning a silicon single crystal substrate; and

a vapor phase epitaxy step of mounting the silicon single crystal substrate on a susceptor arranged within a reactor with a non-oxidizing atmosphere and epitaxially growing a silicon epitaxial layer after the cleaning step,

wherein in the cleaning step, front main surface

oxide film formation cleaning for forming an oxide film on a front main surface of the silicon single crystal substrate is performed as final cleaning of the front main surface and rear main surface natural oxide film removal cleaning for removing a natural oxide film formed on a rear main surface of the silicon single crystal substrate is performed as final cleaning of the rear main surface.

10. The method for producing the silicon epitaxial wafer as claimed in claim 9, wherein a time for the silicon single crystal substrate to be stored in air during the period that the substrate is fed into the reactor after the final cleaning is set within 6 hours.

11. The method for producing the silicon epitaxial wafer as claimed in any one of claims 1 to 10, wherein the silicon single crystal wafer is a double-sided mirror silicon single crystal substrate of which both the main surfaces are subjected to a mirror polishing finish.

12. A silicon epitaxial wafer produced by the method according to any one of claims 1 to 11.

13. A silicon epitaxial wafer comprising:

a silicon epitaxial layer formed on a front main surface of a double-sided mirror silicon single crystal substrate of which both the main surfaces are subjected to a mirror polishing finish; and

wherein a haze level of the whole rear main surface is 0.1 ppm to 50 ppm.

14. The silicon epitaxial wafer as claimed in claim 13, wherein a haze level of the whole rear main surface is 0.1 ppm to 0.5 ppm.

15. The silicon epitaxial wafer as claimed in claim 13 or 14, wherein a diameter of the silicon epitaxial wafer is 300 mm or more.